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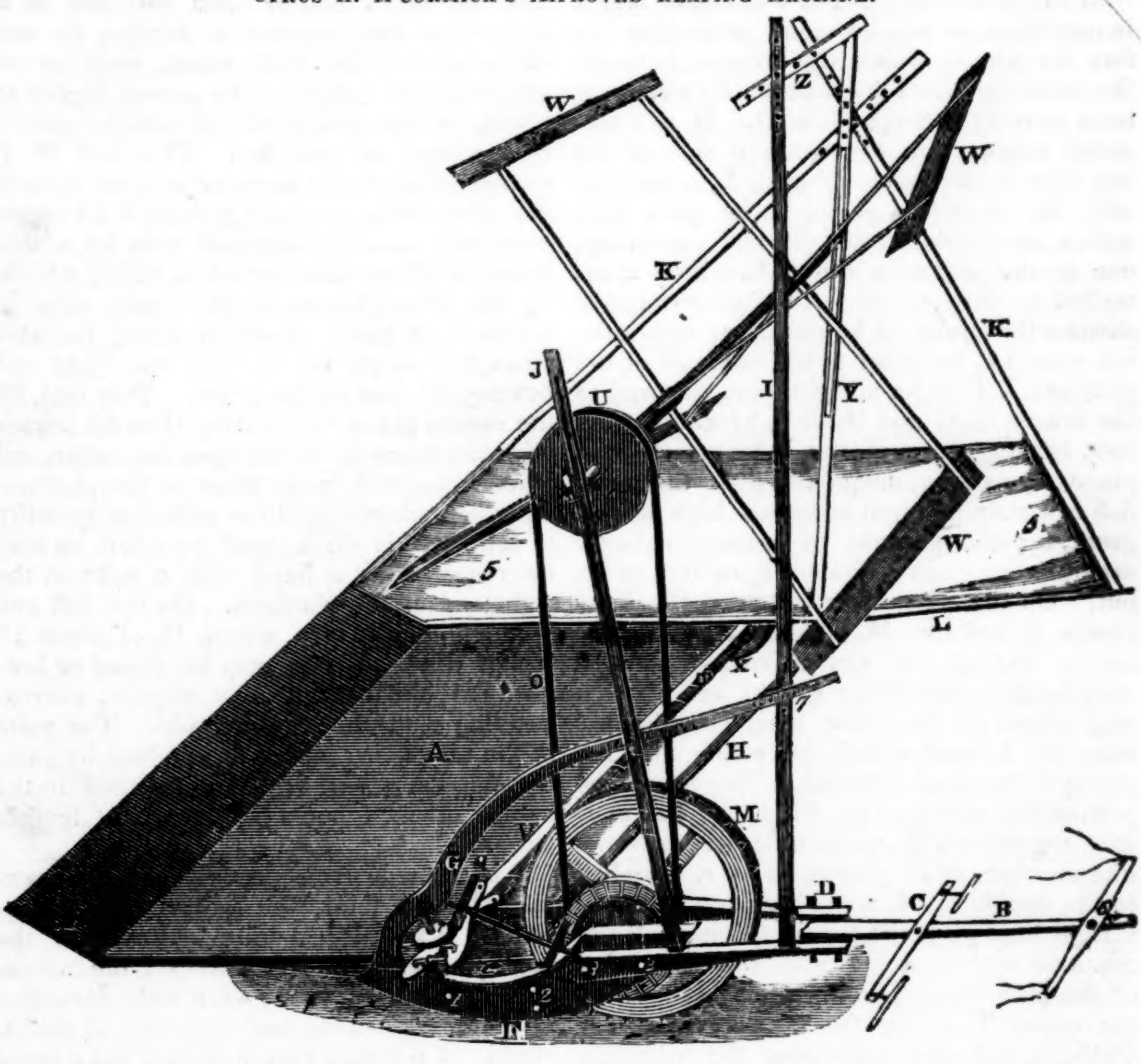
"It is a strange thing to behold what gross errors and extreme absurdities men do commit for want of a friend to tell them of them. The help of good counsel is that which setteth business straight."—Bacon.

CYRUS H. M'CORMICK'S IMPROVED REAPING MACHINE.



To the Editor of the Mechanics' Magazine:

Dear Sir,—I send you a drawing and description of my Reaping Machine, agreeably to your request.

References—A, the platform; B, tongue; C, cross-bar; D, hinder end of the tongue; *e e*, projections in front; F, broad piece on each side; G, circular brace; H, diagonal brace; I, upright post; J, upright reel post; K, braces to upright; L, projection to regulate the width of swarth; M, main wheel roughened; N, band and cog wheel of 30 teeth; O, band; *p*, small bevel wheel of 9 teeth; Q, do. of 27 teeth; *r*, do. of 9 teeth; *s*, double crank; T, cutter; V, vibrating bar of wood, with bent teeth; U, reel pulley; W, reel; X, wheel of 15 inches diameter; Y, reel post.

The platform A is of plank, made fast to a frame of wood, for receiving the grain when cut, and holding it until enough has been collected for a sheaf, or more. The projections in front, *e e*, are two pieces of the platform frame, extending about 1¼ feet in front, and one or more feet apart. On each outside of these pieces is to be secured a broad piece of wood, as at F, by screw bolts, as at 1 1, passing through them and the pro-

jection of the frame. From the end of the outer broad piece, nearest the platform, rises a circular brace, G, projecting forward, and secured to the reel-post, I, by a moveable screw bolt. About nine inches in front of the screw bolts, at 1 1, are two other *moveable* screw bolts, as at 2, passing through both broad pieces and the ends of both projections, allowing for a rise or fall in adjusting the height of cutting; and at about the same distance, further on, is to play an axis of a wheel to be hung between said pieces. Near each end of this axis is secured an arm with two screw bolts, as at 3 3, one of which is moveable, as will be seen; projecting before the wheel, where the tongue is made fast between them by means of two screw bolts passing through all at D. H is a diagonal brace. On the opposite side of the machine is another reel-post, Y, connected near the top with a piece, K, on each side, with a moveable screw bolt, and extending, one to the end of a piece, L, which is attached to the outside of the platform, and divides the grain to be cut, from that to be left standing, the other to the hind end of the platform. T is an upright post, secured to the braces of G and H, at 7, by a moveable bolt, bracing the reel-post Y by means of a piece, Z, passing diagonally over the reel. 5 5 is a strip of cloth about as high as the grain, for the purpose of keeping entirely separate the grain to be cut from that to be left. On the axis, hung between the hind pieces, is a wheel, M, of about two feet diameter, having the circumference curved with teeth to hold to the ground by. N is a cog wheel on the same axis, which serves also for a band wheel, on which and the pulley U the band O works. The cog wheel *p* working into the cog wheel N, has another cog wheel, Q, on its axle, which works into another small pinion, as at *r*, attached to the double crank *s*. These cranks are in a right line, projecting on opposite sides of the axis and in a line with the front edge of the platform. The lower of these works the cutter T, along the front edge of the platform, and the upper one the vibrating bar V, counter to each other. The cutter is a long blade of steel, with an edge like that of a reap-hook, and is supported on the under side by stationary pieces of wood at suitable distances apart. This blade is attached to the frame piece, below the edge of the platform, by means of moveable tongues or slips of metal; the bolt securing it to said frame-piece acting as a pivot, and that through the blade likewise, so that the motion is described in part of a circle. The vibrating bar is of wood, of the same length, and secured in the same manner, above the cutter, with iron teeth made fast in it, at about 2 inches apart, extending before the edge of the cutter, and bent round under it. This vibrating bar has been and may be made stationary, with bent teeth supporting the stalks on each side of the cutter, thereby dispensing with the upper crank; but the other is much preferable, as it reduces the friction and liability to wear materially, by dividing the motion necessary for one between the two, and counterbalancing each other.

In the upper end of each reel-post is a groove, or long mortice, to receive the end of the axis of the reel, which rests on an adjusting pin, subject to be moved higher or lower, to suit grain of different heights—rye, wheat, or oats, &c. The reel W is composed of two or more cross arms at each end of the axle, projecting about 3 feet each way, and connected at their ends by a thin board of about nine inches in width, which, by the arrangement of the arms, runs in a somewhat spiral direction along the axis (though it might be parallel), the right end bearing up first on the grain. This reel, by the motion given by the strap O as the horses advance, bears the stalks upon the cutter, and when separated lands them on the platform A, which advancing till a sufficient quantity is collected, is discharged as often as may be required by a hand with a rake at the right end of the platform. On the left end of the platform is a wheel, H, of about 15 inches diameter, that may be raised or lowered as the cutting may require, corresponding with the opposite side. The point of the tongue is secured to its place by passing through a pin, 6, that is fastened to the hames of each horse by means of leather straps.

I have made some alterations on the drawing, which I think you will readily understand. Two horses were not used to the machine until the last harvest; the necessary changes of which were only described to the draughtsman, and were not all understood. I directed that it should not exceed 5¼ inches, though I think it does one way. The wheel H I think has a wrong direction.

Very respectfully, yours, &c.

C. H. M'Cormick.

Improvement of the Barometer.

[From the American Journal of Science and Art.]

To Prof. Silliman:

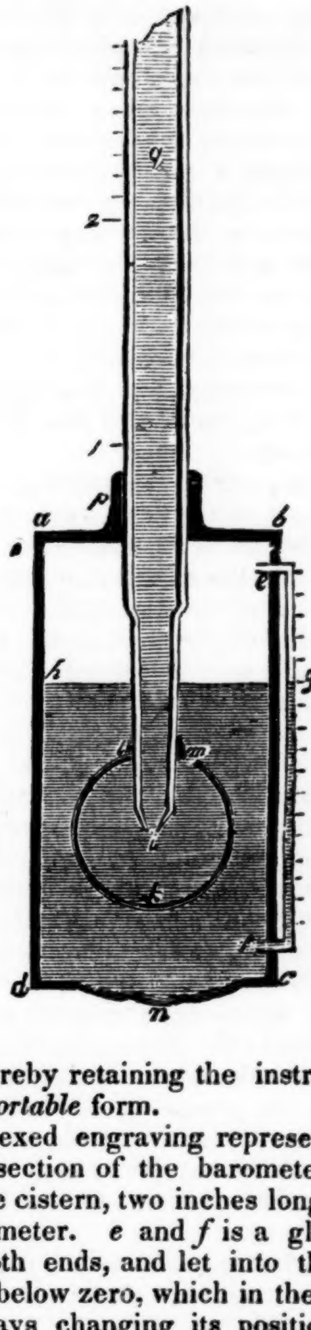
Dear Sir,—In the frequent use of the portable barometer, I have often experienced much inconvenience from air entering the

tube, at times when perhaps great precision was necessary, not only for ascertaining the altitude, but likewise for weighing the atmosphere, which is sometimes intimately connected with other experiments, then under a course of investigation.

Although one of the most simple in form, the barometer is probably one of the most difficult instruments to *construct*. The frequent breaking of the tubes, while undergoing the great heat which is necessary to exhaust the air, requires more patient care for this tedious process than most men are able or willing to devote; and yet, without this process, and that well and effectually performed, the air must be diffused through the mercurial column, or escape to the top, where it destroys the vacuum, in which case the instrument is not suitable for the purpose intended, and does not deserve the name of barometer. The manufacturer who would allow such an instrument to pass from his hands to the world, is guilty of a great misdemeanor, and deserves the censure of all good men; for such imperfections have prevented the barometer from attaining the rank which it deserves in the estimation of the world. It is an insult to the memory of *Torricelli*, who will yet be ranked among the greatest benefactors of mankind.

It is to be regretted that so many imperfect or deranged instruments are in use. It destroys all confidence in the barometer, and I know some persons who *deride* its well known properties of predicting winds, and even treat the idea as *chimerical*. But such men could not have possessed a perfect instrument, or have devoted a proper attention to the observations, as thousands can testify to its efficient warnings; when, by suitable and timely preparations for the predicted hurricane, property and lives have been saved from the devastating elements, which would otherwise have involved the whole in ruin.

Although in the construction and repairing of my barometer I was generally fortunate in clearing the tube entirely of air, yet, in use, I think I never kept it one year in that perfect condition. This repeated derangement and consequent expenditure of time, patience, and money, led me first to inquire the cause, which I soon learned, and then undertook to invent something which should effectually prevent the evil. I soon succeeded, even beyond my most sanguine expectations, so as even to render the instrument perfectly secure against all accidents, except breaking, to which *all* instruments are subject. With this security I have not encumbered the barometer with any thing on the outside, but the whole is confined to the cistern, thereby retaining the instrument in the most *portable* form.



The annexed engraving represents a vertical half section of the barometer. *a b c* and *d* is the cistern, two inches long and one inch in diameter. *e* and *f* is a glass tube, open at both ends, and let into the cistern above and below zero, which in the barometer is always changing its position. The original zero is marked on this tube at *g*, with decimal parts of the inch, extending above and below, to be deducted from, or added to, the height of the mercurial column in the large tube. *h* is zero, which, when made on a level with the ocean, stood ¾ of an inch from the top of the cistern, which immerses the top of the globe ⅜ of an inch in mercury. The ¾ of an inch between original zero and the top of the cistern, leaves sufficient space for the column, in high altitudes, to fall: a circumstance which has never been properly attended to in constructing barometers; although probably no other barometer will admit of so much space, without endangering the instrument. *i* is the end of the tube, with the column drawn to a small point, which answers precisely the same pur-

pose as the contraction in M. Gay Lussac's "improved marine portable barometer." But in this case the contraction at the bottom of the tube possesses other advantages than merely to prevent the sudden rise and fall of the mercury; for by placing the contraction at the bottom, we can draw the end of the tube to a small point, which renders the column less liable to admit air, either from a concussion or inverting its position.

This improvement alone I deemed of sufficient importance to justify the *construction* of a new barometer, and was actually prosecuting it, when an idea of the *globe* suggested itself to me.

In all the portable barometers that I have seen, the end of the tube is cut or broken off in a careless manner, which as often leaves it *concave* as *convex*, and it must be apparent to every one who will examine the subject, that bubbles of air striking the *concave* end of a straight tube are more likely to enter the column than to roll off.

k is the *globe*, ⅝ of an inch in diameter, fixed firmly on the tube at *l*, and has a very small aperture at *m*, the only place where the mercury inside can communicate with that in the cistern. The globe is of cast steel, with which mercury is known to come in *perfect contact;* consequently the atmospheric pressure *cannot* force the air through this aperture, nor through the bottom of the tube. By examining this arrangement, you will perceive the impracticability of even *forcing* the atmosphere through the globe, much less the possibility of its being driven there by inverting and re-inverting the instrument, or by any jar or concussion which it may receive while in use or being transported.

Even admitting air to be *placed* in the globe, it is apparent that it would find its way out by the aperture one hundred times oftener than it could possibly enter the tube.

n is the leather bag through which the atmosphere communicates its influence to the whole interior of the cistern and column. Leather is the most in use, although there are other methods to admit the atmospheric pressure, in forms of the instrument, which are perhaps not so portable; although, for general use, a short tube, with a stop-cock or plug inserted in the top of the cistern, is probably the best.

o represents a screw joint of the cistern, where it is separated while attaching the globe to the tube; for the tube being connected with the cistern at *p*, would render it impracticable to fasten the globe without this separation. I mention these minutiæ, because those who undertake to make a barometer on this plan may otherwise be subject to the same perplexities which I experienced in the construction of mine.

I did not succeed in obtaining a globe, until the *third* person made the attempt, and produced it from a solid piece of steel. If made in *two* parts, it would necessarily be joined with solder, on which the mercury would act too powerfully.

The screw joint at *o* may appear simple and useless, but the *want* of it occasioned a delay of many days, and caused the breaking of several tubes, while trying to fasten the globe. The person employed on this part, twice threatened to abandon the work as impracticable, when fortunately the idea occurred to me of disconnecting the cistern in that part to afford ample space to work at *p*.

q is the mercurial column, ¼ of an inch in diameter, except the part inside of the cistern, which is diminished in order to leave the more vacant space for the column to fall in high altitudes, and likewise to lessen the large orifice in the globe through which the tube enters.

Other proportions than those here given may serve equally well to construct a barometer on this principle, but these are the dimensions of the one which I have now completed, and for distinction will call the *Globe Portable Barometer*. It has been inspected by several scientific gentlemen, who, with my request, exposed it to all the causes which usually derange barometers, such as jarring, shaking, concussions, inverting and re-inverting its positions, without causing the least perceptible derangement. I invite all, who are so inclined, to call and see it; and to those who desire to make one, I will cheerfully give any information in my power to aid them in its construction.

Since the invention of the barometer by Torricelli, many learned men have devoted their attention to the improvement of this valuable instrument, and among the most useful is probably M. Gay Lussac's "*Improved Marine Portable Barometer*," wherein, at a certain point, the column of mercury is contracted to prevent the sudden rise and fall of the mercury by the undulating motion of the ship, while the remainder of the column retains sufficient diameter to avoid a very sensible effect from the temperature of the atmosphere. But this, as well as other forms of the barometer, whether secured by the screw and cushion pressing on the bottom, or by the stop-cock as employed by Mr. J. F. Daniels, is liable, by sudden turning or concussion, to admit air into the tube; for although the cushion and

stop-cock renders the instrument *portable*, it never can be *employed* as a barometer, until the entire column is open from the hermetical seal to the cistern or atmosphere below. It is in this situation, (the only one of practical use,) that the instrument is deranged. *First*, by suddenly inverting and re-inverting the position, so that, (while passing from the bottom to the top of the cistern,) the air strikes the end of the mercurial column, and must rise in the tube, because it is lighter. *Secondly*, by a concussion which it receives every few minutes while in use, either from the motion of the ship, the carriage, the shrubbery on a mountain, or the unavoidable contact with the car and cords in a balloon; for by observing the mercury in a glass cistern, you will perceive that a concussion causes a motion like the sea waves, which mounting on one side frequently leaves the end of the tube exposed to the atmosphere, which here strikes the base of the column, and rises in the tube by its comparative weight. *Thirdly*, it is asserted that the barometer, in a course of years, will have accumulated air above the column, even if during all that time it should have been suspended in a room, without any jar or concussion to communicate the least motion; and the two most probable causes assigned are, first that the air enters through the pores of the tube, and secondly, that mercury never comes into perfect contact with glass; the latter is the most probable cause, from which it is inferred that the air in the cistern is by the atmospheric pressure forced down in extremely minute particles between the mercury and the tube, where it acquires the additional impetus of its own comparative specific gravity, and rises between the mercury and internal surface of the tube to the top of the column. As a preventive to the latter derangement, it has been suggested, and I believe practised by some, to fit closely on the bottom of the tube a ring of platina, or any other substance with which mercury comes in perfect contact, although without sufficient action to cause, for years, any perceptible diminution.

From the important purposes to which the barometer is adapted, it may well be supposed to have enlisted the attention of the most scientific men in all countries, and, indeed, for some of its uses it is invaluable, and probably no instrument will ever be invented with any proportion of its combined properties. For although by a number of instruments we can weigh the atmospheric pressure, yet even if the instruments would give the precise weight, the time occupied to obtain the result would render useless the object for which the trial was made, as the wind or calm would have actually arrived which was predicted by the state of the atmosphere when the barometrical observation was made.

A gentleman commanding one of the New-York and Havre packets, for whose scientific knowledge I entertain a high regard, told me, "that when the ship was moving with much velocity, even the barometer could not indicate the current of air," for, said he, "the ship will have moved beyond the influence of the wind, which was indicated when the barometrical observation was taken." The remark is worthy of consideration, and the want of a due attention to it is probably one of the causes which has aided to retard the more general use of this instrument among mariners. But by far the greatest cause which has prevented the universal use of the barometer, is the difficulty of procuring a good one, and the still greater difficulty of retaining it in perfect condition. It is not always easy to procure a workman competent to construct one, and when such a man is found, he is not able to devote that attention which is necessary to its adjustment, and to the boiling of the mercury in the tube, lest he should not meet the views of his customers, who are in the habit of purchasing at too low a price.

We may measure mountains by observed angles, but those who have tried the various methods give a decided preference to the barometer, which, in some cases, is the only instrument by which we can ascertain their altitude. For the cyanometer never can be used with accuracy, while sight differs with different men, or while the coloring matters for the blue tints differ so much in consequence of the soil or matter which produce them, and are so subject to change by exposure to the various climates. In the account of his travels and philosophic researches, Baron Humboldt has in many instances given us the degrees exhibited by the cyanometer, but for any satisfaction to the world, or benefit to science, he may as well have spared himself that trouble, for allowing all men to see alike, who, on being told that the cyanometer exhibited 10 or 60, has any conception of the height? We have nothing to which we can refer for accurate comparison, either impressions on the brain, or unalterable blue colors portrayed in cyanometrical form.

Being at Paris in July, 1828, I applied to some of the most reputable philosophical instrument makers for a cyanometer, but not one of them had any knowledge of it, or even knew there was such an instrument. I then

called on Messrs. Gay Lussac, Cuvier, and Biot, for information respecting it. The last named gentleman was absent from the capital, which deprived me of the pleasure and information I should have derived from a conversation with him. M. Gay Lussac told me, "that he considered the instrument of very little utility, and that it was found only in the works of M. Saussure, a young gentleman of extensive scientific acquirements, who with an inventive genius combined an untiring zeal for knowledge. He travelled extensively, and it was during his passage over the Alps, where, from the blue color of the heavens, an idea occurred to him of constructing an instrument with degrees and altitudes marked to each of the blue shades, which should correspond to those in the heavens." And, continued the sage philosopher, "Saussure is dead, and those only who have been at great heights, and retain a recollection of the color, are capable of making a cyanometer."

With the information I derived from him, and my subsequent experience of these colors, I constructed such an instrument; and after repeated trials, comparing it with the barometer, at various altitudes, I found it could not be relied on for accuracy.

Many men who have devoted their attention to the subject I believe are convinced, that both the cold and darkness increase as we recede from the earth; and I have no hesitation in saying, that beyond the earth's atmosphere it is as much darker than night as any thing we can conceive; and although this darkness may increase in regular progression from the earth, still, from causes before related, I do not believe that any instrument can be found as a substitute for the barometer in measuring high altitudes.

At my fifth ascent with a balloon, from New-York, in May, 1833, I was compelled, in consequence of a high wind which prevailed, to unmoor without any philosophical instruments, except the cyanometer, which I had fortunately placed in my pocket-book. From causes which were stated in the public journals, the balloon was uncontrollable for some minutes, (a part of which time it was ascending with nearly the rapidity of an arrow,) although immediately on leaving the earth I opened the valve, which is near the top, and through which the gas would soon have escaped, but for the rapid upward motion, which caused so much resistance or pressure from the atmosphere as to retard the escape of the gas until thirty or forty minutes, when the aerostat was poised in air, and I had reached a greater altitude than I have before or since attained. Here for the last time I tried the cyanometer, which, for any utility, I might as well have left below with the barometer. The heavens were many shades darker than the blue tints to which I had affixed an approximate degree and altitude on my cyanometer, and so uncertain is sight, that when I had selected a corresponding shade on the cyanometer, in one instant the heavens would appear too light and the next moment too dark. I resolved then to abandon all further experiments with an instrument which promised to be of so little use; and if it was not to confirm M. Gay Lussac's remarks, and prove the superiority of the barometer, I should not have considered the experiments with the cyanometer worth communicating to the world.

I am aware that, among scientific men, there is an unbelief of the fact that *intensity of darkness increases as we recede from the earth*, but I do not consider it my duty here to enter upon a proof of the assertion, or attempt to explain the cause which produced it. I should infringe on your pages with a work which I do not feel competent to perform, and will leave that for more able pens than mine. The world may expect to have soon a rich intellectual treat on that subject from a gentleman in Baltimore, whose scientific acquirements, added to his profound reasonings and lucid mind, I am satisfied, (from personal acquaintance,) render him in all respects competent to perform the task.

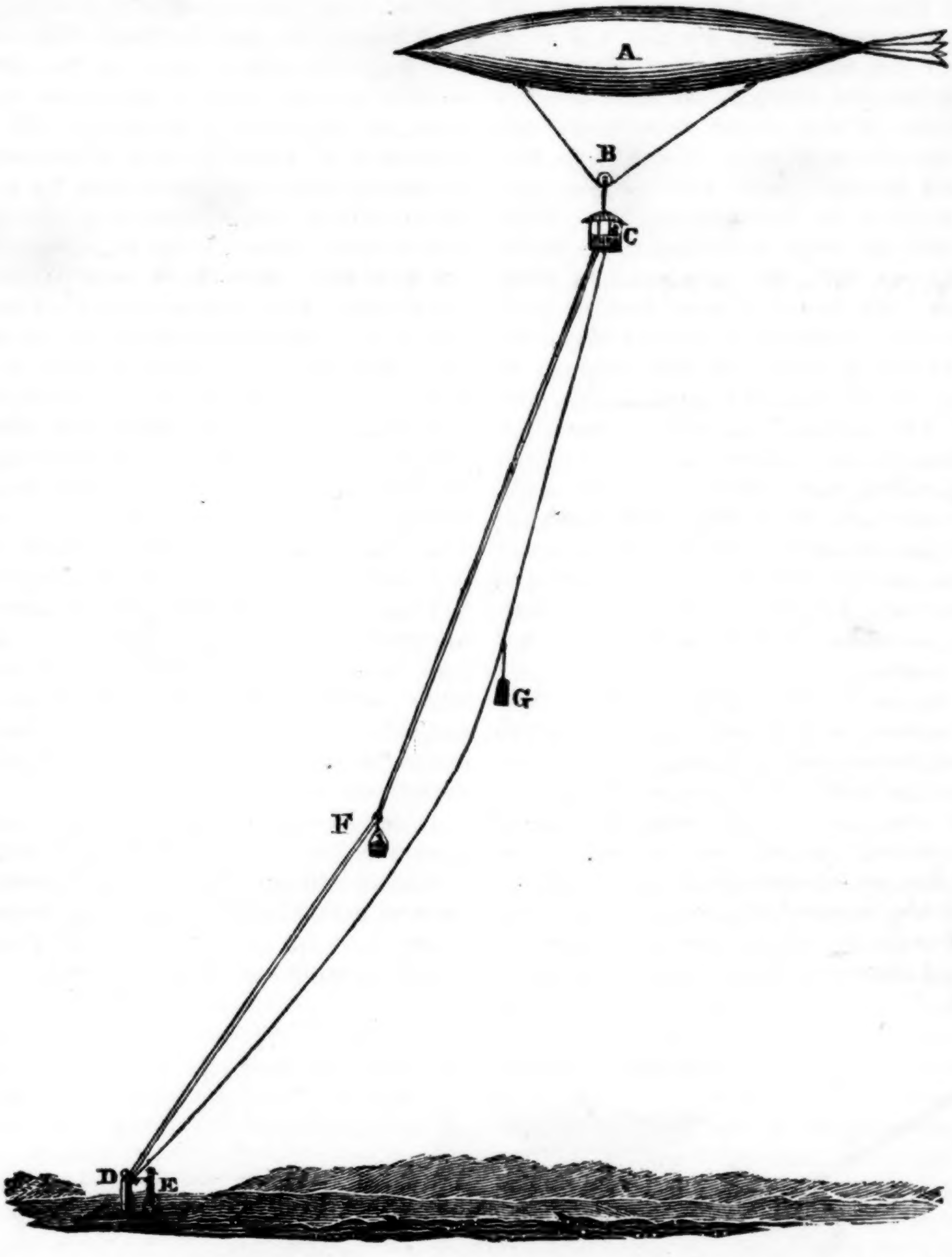
My object in this communication is to explain the principles of my improvement in the barometer, to point out its *advantages* over all others, and induce the world, through your widely circulating Journal, to use the *globe* in all cases where the instrument is required to be *portable*. If science can be improved, and mankind receive a benefit from this effort, if will afford me much pleasure to have contributed a mite to so noble a cause. CHAS. F. DURANT.

Jersey City, 28th July, 1834.

Plan for an Observatory Balloon.

To the Editor of the Mechanics' Magazine:

SIR,—Much curiosity having been lately excited in various places, and much attention drawn to the subject, by the ascension of various balloons, I shall propose a plan by which the same principle may be applied to a more useful purpose than a mere exhibition of the buoyant power of hydrogen gas in atmospheric air. This buoyancy, it is well known, is something more than one ounce to every cubic foot. A balloon in the form of a pointed spheroid, 125 feet long,



References—A, the balloon; B, the pulley to which the ladder is attached; C, the saloon, with a person looking out; D, a post, to which the balloon is moored; E, a man turning a crank, by which the car F is made to ascend; G, a weight used as a counterpoise to the car, &c.

and 25 feet in diameter, would contain about 30,000 cubic feet, the buoyancy of which would be about 1900 pounds avoirdupois. For constructing such a balloon, 500 yards of sheeting would be required, which, when varnished, or made water-proof by gum elastic, would weigh about 500 pounds. Eight rods of wood, to be used in the construction, for the purpose of keeping the balloon in proper shape, and extending the whole length, would weigh 200 pounds. Add to this 400 pounds of cordage, for constructing a rope ladder whereby to moor the balloon to some object on the earth, and 100 pounds for a saloon to be attached to the ladder near the top, there will yet remain a balance of buoyancy of 700 pounds.

A vane, or rather a tail, constructed of some light material, may be attached to one end or point of the balloon, which will keep it invariably pointed in the direction of the wind.

I have ascertained by some recent experiments, that the force or pressure of a wind that travels 35 miles in an hour, (which is a gale,) is about ten pounds on every square foot of canvas, placed at right angles with its direction. It also appears from other experiments, (also by calculation,) that a pointed spheroid, whose length is equal to five times its diameter, sustains, when point-

ed to the wind, but one twenty-fifth part of the force that is sustained by the end of a cylinder of the same diameter. Hence we may infer that the pressure of such a gale on a balloon of the above dimensions, the area of the circumference of which is 475 feet, would be only about 190 pounds, exclusive of that on the ladder, &c. This would carry the rope or ladder to an angle of 60 degrees with the horizon. In addition to the rope ladder, a small leather pipe or hose will be required, to extend from the balloon to the ground, for the purpose of supplying the balloon with gas, should any escape. The head of the ladder must not be attached to the balloon, but to a block or pulley, which may move forward or backward occasionally on a rope, the two ends of which are secured to the balloon between the points and the centre, as represented in the engraving; by this arrangement the balloon will have more liberty to retain its horizontal position.

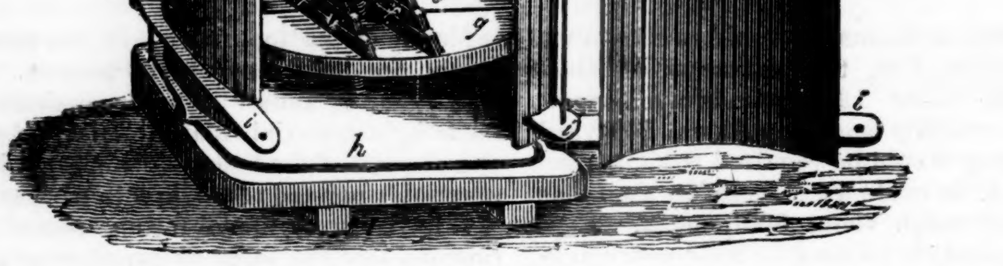
With regard to its utility, if such a balloon be moored in a central part of a large city, a watchman may be stationed alternately at a height sufficient to overlook the city, and not only give a ready alarm in case of fire, but inform the firemen by signals, by night or day, in what street or section of the city their aid is wanted—the watchman being informed, (in case the fire is not visible,) by a signal displayed by any fireman or other person, from the top of the building, or of one adjacent to that on fire. This watchman may also give notice of the approach of vessels, long before they can be seen from an ordinary observatory. It would, moreover, be a gratification of curiosity, but a valuable lesson of information, for any person to take a general view of the city and surrounding scenery from an elevation of a thousand feet; and there can be but little doubt that such a balloon, (which would cost less than a thousand dollars,) would be well supported by the contributions of such visitors. The saloon should be furnished with good glasses, and to avoid the fatigue of climbing, a car, with a convenient seat, may be made to ascend or descend the ladder with passengers, by means of a counterpoise and a slight exertion of the attendant.

I had thought of recommending an electric rod; but considering the nature of the materials of which the balloon is composed, I am confident that lightning will never affect it sufficient to rend or burn the cloth; and it is well known that the gas cannot be ignited except in contact with oxygen or atmospheric air.

In my next I may give some hints on the practicability of propelling and navigating a similar balloon; but for the present shall content myself with subscribing, respectfully yours, R. PORTER.

Billerica, Mass., Sept. 5, 1834.

BEECHER'S PORTABLE CIDER MILL AND PRESS.



This machine combines in one the grinding part and the press. It occupies a space of five or six feet square. It is a very economical cider mill. Mr. B. has not yet fully established its merits from practical experiments.

References—*a*, hopper; *b*, grinding apparatus; *c*, cog wheel; *d*, screw of the press; *e*, entrance of the lever; *f*, blocks; *g*, planks for pressing; *h*, bottom of the press; *i*, holes to secure the braces or arms; *k*, rods or pins; *l*, beam to attach the horse; *n*, door to take out the pomace.—[New-York Farmer.]

History of Astronomy—its various Systems, &c. [Continued from page 164.]

MOTIONS OF THE EARTH.—When we consider the apparent diurnal motion of all the celestial bodies, we cannot but recognise the existence of one general cause, which produces this appearance. But when we consider that these bodies are not only at different distances from the earth, but at different distances from each other, and that these distances are not always the same, we shall find it difficult to conceive that it is the same cause that produces this appearance on all of them.

The difficulty, however, becomes considerably less, when it is recollected that a person in motion, looking at an object at rest, perceives the same change of position in the object as if he were himself at rest, and the object in motion in the opposite direction. Every one who has looked for the first time from the window of a carriage moving quickly along the road, or from the deck of a ship sailing smoothly along the shore, fancies that every thing which the carriage or vessel passes is in motion, and that he is himself at rest.

An appearance still more deceiving takes place, when a person looks out of the cabin window of a ship in a dark night, at a distant light apparently in motion. For the change of place in the light may arise either from its being really in motion, or on board of another vessel, while the vessel in which the spectator is, is placed at anchor; or the light may be stationary, and its apparent motion occasioned by the motion of the ship which carries the spectator; or it may even be occasioned by the motion of the vessel which carries the light being quicker or slower than the one which carries the spectator. The difficulty in determining to which of these causes the motion of the light is to be attributed, arises from the want of some intervening object whose state is known, and by which the apparent motion may be compared. Now, this is precisely the situation in which we stand with regard to the heavenly bodies, for the motion of the earth on its axis, if it really has such a motion, must be incomparably smoother than any vessel or machine made by human art; and as there is no fixed intermediate object between it and the heavenly bodies, no direct proof of this motion can be obtained.

As far, then, as appearances enable us to judge, either the earth may be at rest, and the heavens carried round it every twenty-four hours, or the heavens may be at rest, and the earth revolve round its axis in the same time. For the rising and setting of the sun and stars, with all the other celestial phenomena, will be presented in the same order, whether the heavens revolve round the earth or the earth round its axis.

However, on comparing these appearances with others which are more within our reach, and with the established laws of motion, we shall find it is much more probable they are occasioned by the revolution of the earth on its axis than the revolution of the whole heavens. For as the heavenly bodies present the same appearances to us, whether the firmament carries them round the earth, or the earth itself revolves in a contrary direction, it seems much more natural to admit the latter hypothesis than the former, and to regard the motion of the heavens as only apparent.

The semi-diameter of the earth is only about 4000 miles, and consequently its circumference is about 25,000 miles.

This is, therefore, the space every point of its equator must pass through if the earth revolves on its axis, which is little more than 1000 miles per hour, or about 17 miles per minute. This velocity is certainly very considerable, being nearly equal to that of a cannon ball when it leaves the mouth of a cannon; but it becomes totally insignificant when compared with the motion of some of the heavenly bodies, required on the other supposition. The distance of the sun from the earth is about ninety-five millions of miles; and therefore, if he revolves round the earth in twenty-four hours, he must pass over more than six times this space in the same time, and consequently must move at the rate of about 25,000,000 miles per hour, which is more than 20,000 times quicker than a cannon ball. The planet Uranus is about twenty times farther distant from the earth than the sun, and consequently the velocity of its daily motion must be twenty times greater. But although these velocities are sufficient to startle the imagination, they are really nothing when compared to the rapidity with which the fixed stars must move to accomplish a revolution round the earth in twenty-four hours. If the distance of the fixed stars be assumed at 200,000 times the distance of the sun from the earth, they must move over the space of 1,400,000,000 miles per second, in order to complete a revolution round the earth in twenty-four hours! This is a degree of velocity of which we can have no kind of conception; and yet, if we consider the velocity which those stars must have that are many thousands of times more distant from the earth, it must be almost infinitely greater. If we, therefore, take into consideration the number of bodies that

must move, and the prodigious rapidity of their motions, to produce the same appearances which the revolution of one body with a comparatively moderate velocity can produce, we shall scarcely hesitate a moment in concluding that the motion of this one body is the true cause of these appearances.

This conclusion must appear still more obvious when we attend to the comparative bulk of these different bodies. Of the planets which belong to the solar system, three of them are known to be much greater than the earth; Jupiter being nearly fifteen hundred times; Saturn, nine hundred times; and Uranus, eighty times. But the sun exceeds them all in magnitude, being considerably more than a million of times greater than the earth. Our ignorance of the real distances of the fixed stars prevents us from ascertaining correctly their real magnitudes; but from what we know of their distances, we are entitled to conclude that they are at least equal in size to the largest of the planets. If such, therefore, be the magnitude of these bodies, how inconsistent would it be with every idea of order and arrangement, to suppose that such a vast number of immense bodies daily revolve round such a little and comparatively insignificant body as the earth! What extraordinary power would be necessary to retain them in their orbits, and counterbalance the amazing centrifugal force which they must possess! The idea, too, of so many immense and independent bodies, so vastly distant from the earth and from each other, performing their revolutions round this little ball, exactly in the same number of seconds, is scarcely to be entertained for a single moment; all the phenomena, especially when supposed to arise from these revolutions, can be satisfactorily and easily accounted for by supposing the earth to revolve on its axis.

If we suppose the planets to be carried round the earth, from east to west, every twenty-four hours, and also allow them a motion peculiar to themselves from west to east, (which they are observed to have,) we produce such a combination of opposite motions as has never yet been observed in any of the heavenly bodies, and which it would be impossible to reconcile with any of the known principles of mechanics. But the rotation of a body on its axis, combined with a motion in its curvilineal orbit, is what we are quite familiar with, and what is exhibited by a school-boy on spinning his top.

But one of the strongest proofs of the rotation of the earth is its figure. For it is now well known that the earth is not a perfect sphere: its polar diameter being considerably less than its equatorial.* It is also known that this is the shape which a spherical body would in time assume, if it revolved on a fixed axis; and therefore it is reasonable to conclude that the spheroidical figure of the earth is occasioned by its rotatory motion. This conclusion is supported by the extraordinary fact, that the difference between the polar and equatorial axis of the earth, as deduced from theory alone, is nearly the same as from actual measurement of various arcs of meridian circles. The same conclusion is further supported by analogy.

A rotatory motion has been observed in several of the other planets, and from west to east, the direction in which the earth must revolve in order to occasion the apparent diurnal motion of the heavens from east to west. Jupiter, a much larger body than the earth, turns round his axis in less than twelve hours. Now, both the earth and Jupiter are known to be flattened at the poles. All these facts, therefore, lead us to conclude that the earth has really a motion of rotation, and that the diurnal motion of the heavens is only an illusion produced by this rotation.

The diurnal rotation of the earth being assented to, its annual motion will scarcely be denied; for its similarity to the other planets is considerably strengthened by this circumstance. For the planets being found to revolve on their axis, and to be flattened at the poles like the earth, and being found to have periodical revolutions from west to east, we are led to suppose that the earth has a *similar* revolution, in order to render the analogy between it and the rest of the planets complete. But the appearances afford us as little assistance in ascertaining the truth of this supposition, as in the case of the diurnal motion; for, whether we suppose the earth to be at rest, and the sun to move round it in the ecliptic in the course of a year, or the sun to be at rest, and the earth to describe this path in the same time, the phenomena of the seasons, eclipses, and all other appearances connected with the sun's annual motion, may be explained on either hypothesis. But, although this be the case, it is much more probable that these appearances are produced by the annual motion of the earth round the sun, than by the motion of the sun round the earth; for, by supposing the earth to move round the sun, we not only give order and simplicity to the solar system, and preserve the analogy which is so conspicuous among the other bodies which

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* Some of the objections which have been stated against the rotation of the earth will be noticed in tre[illegible] the Ptolemaic and Tychonic systems.

compose that system, but we remove several difficulties which unavoidably attend the opposite hypothesis. It has already been remarked, that the earth is considerably smaller than several of the other planets, and that it is about fourteen hundred thousand times less than the sun ; it is therefore quite inconsistent with every idea of order and arrangement, to suppose that bodies of such extraordinary size should revolve around one of comparatively small magnitude. For, independent of the complication of the planetary motions which such a supposition would introduce, it would overthrow one of the best established principles of mechanics, and is quite inconsistent with the law which is known to subsist between the times of the revolutions of the planets, and their distance from the sun, for the further they are from the sun their motion is the slower: their periodic times of revolution being to each other as the cubes of their mean distances from the sun. Now, according to this remarkable law, the length of a revolution of the earth round the sun should be exactly a sidereal year. This is therefore an incontestible proof that the earth moves round the sun like the other planets, and is subject to the same laws. To this we may add, that the aspect, of increase and decrease of the planets, the times of their seeming to stand still, and move direct and retrograde, answer precisely with the motion of the earth : but cannot be reconciled with that of the sun, without introducing the most absurd and monstrous suppositions, which would destroy all order, harmony, and simplicity, in the system.

But the most direct proof of the earth's annual motion is derived from the aberration of light. For during the time which light takes to pass over the semi-diameter of the earth's orbit, which is 8′ 13″, the earth ought to move 20″·232 in its orbit, and this is found by observations to be actually the case.

The annual as well as the diurnal motion of the earth may, therefore, be considered as completely established. The objections which have been urged against these motions, by the supporters of the Ptolemaic and Tychonic systems of the heavens, will be noticed when treating of these systems.

To the texts of Scripture which seem to contradict the motions of the earth, the following reply may be made to them all. That it is plain, from many circumstances, that the Scriptures were never designed to instruct men in philosophy, but in matters of religion, and are not always to be taken in the literal sense : for Job describes the earth as being *supported* upon *pillars*, and in another place as being hung upon *nothing ;* and Moses calls the moon a great luminary, although it is well known to be an *opaque* body, which shines only by reflecting the light of the sun.

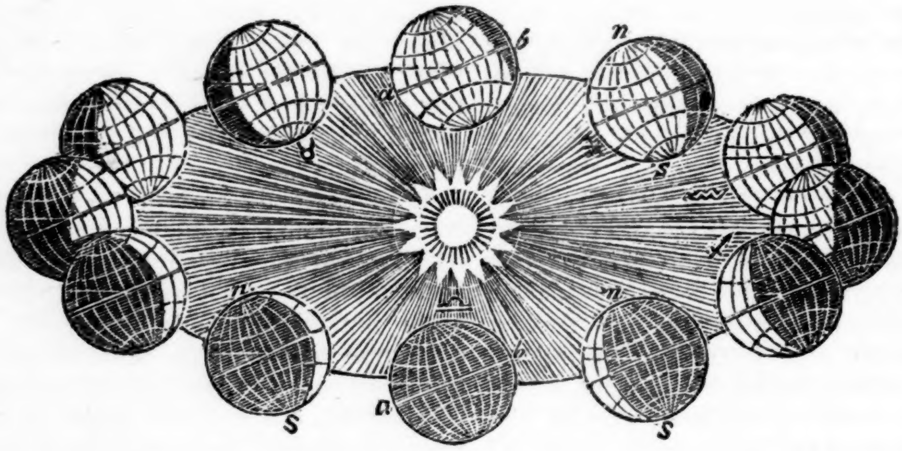
It is perfectly certain these expressions were not meant to convey any astronomical opinion, but employed because they would be easily understood by those to whom they were immediately addressed. In familiar discourse astronomers themselves speak of the sun's place in the ecliptic, of his rising and setting, &c. ; for if they did not, they would be under the necessity of explaining their meaning every time they had occasion to mention those appearances.

On the Changes of Seasons.*—The alternate succession of day and night, as well as the variety of seasons, depend entirely on the motions of the earth. For if the sun and the earth were perfectly at rest with respect to each other, it is evident that one half of the earth would always be in the light, and the other half in darkness, as the sun can only enlighten one half of its surface at a time. But as the earth turns round its axis once in twenty-four hours, any particular place on its surface will pass through light and darkness alternately. As long as it continues in the enlightened hemisphere, it will be day at that place ; but while it passes through the opposite hemisphere it will be night. But although the regular succession of day and night be occasioned by the diurnal revolution of the earth on its axis, yet this motion is not of itself sufficient to produce that variety in the lengths of days and nights which the various places of the earth experience in the course of a year.

For should it revolve on its axis with one of its poles always pointed exactly to the sun, one half of the earth would be constantly in the light, and the other half in darkness, notwithstanding its rotation. Again, if we suppose the earth to turn on its axis, with its equator directly pointed to the sun, then the light would just reach both poles, consequently all places would be in light and darkness alternately, and the days and nights would be exactly twelve hours each at every part of the globe.

If either extremities of the earth's axis, suppose the northern, were to make an acute angle with an imaginary line joining the centre of the sun with any point of the earth's

* If a terrestrial globe be placed in the various positions mentioned in this article, it will contribute very much to impress the mind with the true cause of the change of the seasons.



equator, it would follow that the north pole, and a certain tract round it, would remain always in the light, notwithstanding the revolution of the earth on its axis. Even those places in the northern hemisphere, to which the sun appears to rise and set, would have their days always longer than their nights; at the equator the days and nights would be equal; but in the southern hemisphere the reverse would happen to what took place in the northern. For those places to which the sun appeared to rise and set would have their nights longer than their days; and the south pole would be constantly in darkness, with a tract around it equal to what was constantly in the light round the north pole. It is evident, also, that in this case the sun would be always on the north side of the equator, and vertical to a certain circle parallel to it, which would be as many degrees from the equator as the angle contained between the earth's axis and the imaginary line wanted of a right angle.

This last supposition is in some degree similar to what actually takes place in nature; for the axis of the earth makes an angle of 23½ degrees with a perpendicular to its orbit; and as the axis always remains parallel to itself, or points in the same direction, this angle must be constantly changing as the earth moves forward in its orbit.*

This is well represented by the annexed figure, which shows the earth at twelve different times of the year.

The line *a b* is the equator, *n* the north pole, and *s* the south. The signs of ♐, ♒, &c. denote the points of the ecliptic in which the earth is when it has the positions in the figure.

As the position of the poles of the earth with respect to the sun depends entirely on this angle, their position must always be changing; and, of course, every point on the earth's surface must also alter its position with respect to the sun. About the 20th of March, when the sun, as seen from the earth, enters the sign Aries, the line supposed to join the centres of the earth and sun is perpendicular to the earth's axis; consequently both poles are similarly situated with respect to the sun, as he is then directly over the equator, and the days and nights are equal at every place on the globe. This time of the year is called the *vernal* equinox, because spring commences to the inhabitants of the northern hemisphere, while autumn begins to those of the southern.

* Or, what amounts to the same thing, the axis of the earth makes an angle with the plane of the ecliptic of 66½ degrees.

Swiftness of the Ostrich.—The bird most celebrated for fleetness of running is the ostrich, or bird camel, (*Struthio Camelus*,) as it may well be named. "What time she lifteth up herself on high," says Job, "she scorneth the horse and his rider."* According to Dr. Shaw, the wings serve her both for sails and oars, whilst her feet, which have only two toes, and are not unlike the camel's, can bear great fatigue. Though the ostrich is universally admitted to go faster than the fleetest horse, yet the Arabs on horseback contrive to run these birds down, their feathers being valuable, and their flesh not to be despised. The best horses are trained for this chase. When the hunter has started his game, he puts his horse upon a gentle gallop, so as to keep the ostrich in sight, without coming too near to alarm it, and put it to its full speed. Upon observing itself pursued, therefore, it begins to run at first but gently, its wings like two arms keeping alternate motion with its feet. It seldom runs in a direct line, but, like the hare, doubles, or rather courses in a circular manner; while the hunters, taking the diameter, or

* Job, xxxix. 18.

tracing a small circle, meet the bird at unexpected turns, and with less fatigue to the horses. This chase is often continued for a day or two, when the poor ostrich is starved out and exhausted, and finding all power of escape impossible, it endeavors to hide itself from the enemies it cannot avoid, running into some thicket, or burying its head in the sand: the hunters then rush in at full speed, leading as much as possible against the wind, and kill the bird with clubs, lest the feathers should be soiled with blood.

M. Adanson saw two tame ostriches which had been kept two years at the factory of Podor, on the south bank of the Niger. "They were so tame," he says, "that two little blacks mounted both together on the back of the largest: no sooner did he feel their weight, than he began to run as fast as ever he could, till he carried them several times round the village; and it was impossible to stop him, otherwise than by obstructing the passage. This sight pleased me so well, that I would have it repeated: and to try their strength, I made a full grown negro mount the smallest, and two others the largest. This burden did not seem to be at all disproportioned to their strength. At first they went a moderate gallop; when they were heated a little they expanded their wings, as if it were to catch the wind, and they moved with such fleetness that they seemed to be off the ground. Everybody must some time or other have seen a partridge run, consequently must know there is no man whatever able to keep up with it; and it is easy to imagine, that if this bird had a longer step, its speed would be considerably augmented. The ostrich moves like the partridge, with both these advantages; and I am satisfied that those I am speaking of would have distanced the fleetest race-horses that were ever bred in England. It is true, they would not hold out so long as a horse; but, without all doubt, they would be able to perform the race in less time. I have frequently beheld this sight, which is capable of giving one an idea of the prodigious strength of an ostrich, and of showing what use it might be of, had we but the method of breaking it and managing it as we do a horse."

The traveller, Moore, mentions that he saw a man journeying mounted upon an ostrich; though both this and the instance given by M. Adanson show the circumstance to be of unusual occurrence.—[From the "Faculties of Birds."]

Woollen Cloth made from Old Rags.—It is probably very little known, that an extensive manufacture is carried on in this neighborhood by which old rags are made into new cloth: yet such is the fact, and to so great an extent that at least 5,000,000 lbs. weight of woollen rags are yearly imported from Germany, and other parts, for this purpose. The rags are subjected to a machine which tears them in pieces, and reduces them to nearly their primitive state of wool; and they are then, with a small admixture of new wool, again carded, slubbed, spun, and woven, and they make a cloth not very strong, but answering very well for paddings, shoddies, and other similar purposes. The manufacture is carried on chiefly in the neighborhood of Batley.—[Leeds Mercury.]

Parisian Steam Carriage.—Last week, Messrs. Dietz & Hermann made an experimental trip with a steam carriage of their construction on the road to Vincennes from Paris. This machine, carrying twenty persons, ran from the Barriere du Trone to the Castle of Vincennes, a distance of three quarters of a league, in 11 minutes. It afterwards took an omnibus in tow, in which, and upon the machine itself, there were 48 passengers, and went at the rate of three leagues an hour as far as Nugent. On its return, near the Castle of Vincennes, a tube burst, but it was quickly repaired, and the machine with the omnibus attached to it, and both laden with 53 passengers, reached the Haymarket, Faubourg St. Antoine, in 12 minutes.

A Curious Piece of Machinery to measure Time has been invented by Mr. Andrew Symington, watch-maker, in Kettle. This time-piece is much more simple in its construction than the common eight-day clock, requires only to be wound up once in twelve months, and being quite silent in its movements will be admirably adapted for bedrooms. In this time-piece the pendulum and scapement are done away with, and a simple but efficient substitute is applied to the crown wheel, as in detents, which only allows it to revolve once in an hour, and has quite an uniform motion, without producing the smallest vibration in the machinery. Another important part of the discovery is a particular material for the pivots to move in, which is quite free from any cohesive quality, and requires no oil, therefore avoiding the irregular motion produced by the evaporation of the oil and other causes. Mr. Symington is about to construct a clock on this plan, to be sent to London, for the purpose of being exhibited there.—[Fife Herald.]

The Mr. Symington here mentioned is a son of the late eminent William Symington, the father of modern steam navigation.—[London Mechanics' Magazine.]

MISCELLANIES, *Foreign and Domestic.*—The following notices are translated from Berzelius's last yearly report on the Progress of Science, by Dr. Lewis Feuchtwanger, of New-York.—[American Journal of Science and Arts.]

1. *A new ore of Antimony* has been discovered in the Hartz mountains by Zinkin, which resembles zinkenite, and appears to be also a subantimonio-sulphuret of sulphuret of lead with sulphuret of silver.

2. *A new Tenantite* has been examined by Hemming from a newly opened mine in Cornwall, which consists of

Arsenic - - - -	11·5
Copper - - - -	48·4
Iron - - - -	14·2
Sulphur - - - -	21·8
Silex and Gangue -	5·

3. *Vanadiate of Lead.*—Johnson discovered some species of vanadiate of oxide of lead at Wanlockhead in Scotland; one species occurs on calamine in form of warts, and as large as a pin's head. It is of a dirty white, and appears to be dew of a pale red powder, has a resinous fracture, and specific gravity of about 7. The other is black, and looks like earthy manganese; a third has not yet been described, but Johnston has sent specimens to the Collection of the *Royal* Swedish Academy. It is regularly crystallized, and appears to be a bi-vanadiate of the oxide of lead.

4. *Plumbacalcite* has been described by Johnson as a mineral found at Wanlockhead in Scotland; it consists of carbonate of lime and carbonate of lead; it is crystallized in the primitive rhomboid of the calcareous spar; it occurs both transparent and opaque, and consists of 92·2 carbonate of lime, 7·8 carbonate of lead. By heat the carbonic acid is evolved, and the mineral assumes a reddish color. This mineral offers an interesting proof of the isomorphism of oxide of lead with a rhomboid of carbonate of lime.

5. *Pelokonite.*—Richter describes an uncrystallized mineral, occurring in Chili, with malachite and copper-green under the above name, (from πέλος brown, and κόνις powder.) It contains phosphoric acid and the oxides of iron, manganese, and copper; it has a blackish blue color, gives a liver brown streak of a conchoidal fracture and weak lustre; its specific gravity is between 2·5 and 2·57.

6. *Wolchouskoit.*—Kammerer described a new mineral from Siberia, which is amorphous, bluish green opake, and of conchoidal fracture; its touch is greasy, gives a bluish green streak, and adheres slightly to the tongue; consists of silica, alumina, oxide of chrome, and water.

7. *Worthite.*—This new mineral has been described by *Hess*, and found in a scapolitic boulder from the neighborhood of Petersburg. It is colorless, crystalline foliated, of specific gravity of about 3·0; harder than quartz, infusible before the blow-pipe, and dissolves with difficulty and with effervescence; in soda it becomes transparent, and yields water by heating in a tube; it becomes dark blue with nitrate of cobalt. Hess found it composed of

Silica	40·58
Alumina - -	53·80
Magnesia - -	1·00
Water - - -	4·63

The formula is AAq + SS.

8. *Pyrargillite.*—Nordenskold discovered and analyzed two new minerals from Finland, the one he calls by the above name from its character of diffusing a clayey smell by heat. It is partly black, light, and lustrous, like the Lordawalite, and partly bluish granular or red, and without lustre; it seldom occurs pure in uncrystallized masses, the form of which approaches to a four-sided prism, with truncated angles; sometimes it is traversed with chlorite, so as to appear sparkling by polishing; its specific gravity is 2·505; its hardness 3·5; it is decomposed completely by muriatic acid; it occurs in granite, and it consists of

Silica - - - - -	43·93
Alumina - - - - -	28·93
Protoxide of Iron - -	5·30
Magnesia with some Protoxide of Manganese	2·90
Potassa - - - - -	1.05
Soda - - - - - -	1·85
Water - - - - -	15·47
Loss - - - - - -	0·58

Formula. $\left.\begin{matrix}F\\M\\Mg\\N\\K\end{matrix}\right\} S^3 + 4AS + Aq.$

9. *Amphodellite.*—This is the other mineral discovered by the above author from the lime quarries of Lozo, in Finland; its crystallized form bears much analogy to that of felspar; it is clear reddish, resembles in fracture scapolite, with two passages, which form an angle of 95° 9′; its hardness is 4·5, and its specific gravity 2·793; it consists of

Silica - - -	45·80
Alumina - -	35·45
Lime - - -	10.15
Magnesia - -	5·05
Protoxide of Iron -	1·70
Moisture and Loss	1.85

Its Formula, $\left.\begin{matrix}C\\F\\Mg\end{matrix}\right\}S+3AS.$

There are a few more minerals described which seem to require a thorough examination in order to establish their claims to be called new, as for instance *Skugisan* and *Monophan*, belonging to the family of the zeolites, and noticed by Breithaupt.

The Mengite from Siberia, and the Monticellite from Vesuvius, and noticed by Brooke and Berzelius from Galloro near Rome, a kind of anhydrous zeolite, which is difficult to fuse, and becomes gelatinous with muriatic acid; it is noticed by Necker De Saussure.

In regard to the Xanthite, described in a former number of this Journal, which occurs in Orange County, N. Y., and consists of

Silica	32·708
Lime	36·308
Alumina	12·280
Oxide of Iron	12·000
Protoxide of Manganese	3·680
Moisture	0·600
Loss	24·24

Berzelius observes, that if this analysis approaches to accuracy, and if a small part of the oxide of iron is contained in the mineral as a protoxide, the formula would be $2\left\{\begin{matrix}C\\Mg\\F\end{matrix}\right\}S+\frac{A^2}{F^2}S.$

10. *Ozokerite, a new combustible Mineral.*—This mineral occurs at Slauik, Moldavian District, near the Karparthes, and has been called by Glooker, Ozokerite (οζεῖν to smell, κηρος wax); it is of a talcose structure, the color between green and brown, of the specific gravity 0·955 to 0·970; it may be kneaded between the fingers, melts into a clear mass in the flame of a candle, is soluble neither in alcohol nor water, even when boiling, and but slowly so in ether and spirits of turpentine. This mineral may serve as an excellent material for lamps or tapers, burning like wax, with soft clear flame, and diffusing on its being extinguished an agreeable odor. Specimens are shortly expected from the locality.

11. *Platinum in France.*—A specimen of platinum has been exhibited before the academy at Paris, which has been extracted in combination with silver from galena, and which contains 0·00022 of Platinum; and since 1100 lbs. of the galena are daily produced from the mines, the daily produce of platinum will be 1 lb. 4 oz. 4 drams and 28 grains. The mines of Cohfolens and Alloue Depart. of Choraute are the localities for this platinum.

The Piety of Newton and Locke.—The grand and sublime idea of Divinity is the greatest blessing that ever was bestowed on man. This idea or impression from Deity, though common to the human family, is most powerfully developed in the cultivated mind. After the immortal Newton had traced the hand of Omnipotence through the planetary system, he was so struck with the mighty power of God, that he never heard his sacred name repeated without reverently "bowing his head." Locke, another philosopher, equally of the first order, has, like Newton, testified his adoration of Jehovah. Those justly celebrated authors had studied and reflected too profoundly to be ignorant of the attributes of Deity, or the nothingness of man. Their humble and enlightened piety rendered them conscious of their dependence upon the great source of perfection from whence every blessing flows. After the example of Locke and Newton, how can we justify the thoughtless and insensible part of creation, who, far from acknowledging their gratitude to the Author of all good, have even denied his existence—As in scripture, "the fool hath said in his heart there is no God." The wise and good man will behold God in all his works. Sans Souci.—[Translated from the French.]

Copper in Vegetables.—Some experiments recently made by M. Farzeau in France, have demonstrated the presence of this metal in the vegetables used as food. These experiments have been made with so much accuracy as to demonstrate the actual weight of copper in each plant. The examination shows the proportion to be a few miligrammes of copper to each kilogramme of the plant. Wheat contains 4,666 miligrammes of copper for the kilogramme, flour only 0.666, but the copper is contained in the bran and not in the farinaceous portion, so that the bread made with the coarsest flour is that which contains the largest proportion of the metal. M. Farzeau, indefatigable in his researches, wished to ascertain the quantity of copper which in a given time a man would mix with his bread. According to his calculation a man would eat in the course of fifty years, 6.09 grammes—a very small quantity, in truth, and which could produce no injury. The quantity of bread daily produced in France being 18,000,000 of kilogrammes, there would be consequently 10 kilogrammes of copper eaten daily, or 3650 per year. On the other hand, since the amount of wheat necessary to feed France for a year is nearly 7,600,000,000 of kilogrammes, it results that this quantity of wheat takes from the soil 34,961 kilogrammes 800 grammes of copper—an enormous quantity—which equally proves the abundance of copper in the soil, and its minuteness of division.—[Boston Medical Journal.]

Geological Surveys.—The Geological Society of Pennsylvania has employed Mr. S. Clenison to visit and report on the gold region recently discovered in York county, in that State. This gentleman has recently returned from Paris, where he has served a long and faithful apprenticeship in the school of mines. The Legislature of Tennessee has recently appointed Dr. G. Troost to make a similar survey of the State. Professor Hitchcock has completed his geological survey of the State of Massachusetts. Professor Ducatel is appointed by the Legislature of Maryland to make a geological and topographical survey of that State. Mr. G. W. Featherstonhaugh is engaged under the authority of the United States in a geological and mineralogical investigation of the territory of the Arkansas: his report is expected to be made to Congress in February next. These various and simultaneous appointments evince a determination to develope the mineral resources of the country in good earnest.—[New-York Enquirer.]

Tides.—It is intended to make a series of tidal observations round the coast of Great Britain and Ireland, on the same days, for 16 days together, from 7th to 22d June next. The object is, to ascertain by how much the time of high and low water at each place is before or after those times at the neighboring places; and also to determine, wherever it can be done conveniently, the comparative rise and fall of the tides at the different intervals between the morning and evening tides, or any other differences which regularly affect their height. For this purpose the exact time of high and low water, especially of the former, and the height above or below some fixed mark, are to be observed every day and night during the above mentioned period. The observations thus made, and the results of the comparison of these with others, will be published along with the names of the officers by whom they have been superintended.—[From Instructions issued by the Admiralty.]

Great Castings.—The Screw Dock Company, in New-York, has just imported a pair ot hydraulic presses, to be used in raising ships of a large class. The castings for these presses are enormous. The cylinders weigh sixteen tons each, and measure about seventeen feet in length, and nearly three feet in diameter. The original cost was £15 or $50 a ton; the freight in the packet ship George Washington, £150 sterling, or $700; the duty $800; and the expense of landing them from the ship $200. The gross cost is but about five cents a pound. We presume that so large castings as these have never before been seen in this country. The founder in England stated that it had occupied forty men two days to remove them from one side of his shop to the other.—[Jour. Com.]

We have received, by the packet Napoleon, (says the American Railroad Journal of Oct. 4,) a communication from a friend relative to the proposed railway from Amsterdam to Cologne. Aiming, as we do, to make our Journal a medium of transmission for information on all projects of internal improvement, whether in our country or abroad, we have extracted the following general facts in relation to the above important undertaking.

"This work having received the sanction of the King of the Netherlands, and the King of Prussia, will be immediately commenced under the superintendence of Lieutenant Colonel Bake. The total estimate for the construction of the road, purchase of property, and locomotive engines, warehouses, &c., is estimated at 12,000,000 florins, or about 5,000,000 of dollars. This road is intended to facilitate the intercourse between the great continental emporium, the port of Amsterdam, and the important town of Cologne; from which latter city there exists a good steamboat navigation up the Rhine to Basle. The passage between Amsterdam and Cologne is expected to be performed by the trains of passenger cars in from 10 to 11 hours. The annual trade at present between the two places is 168,000 tons of merchandise, 300,000 tons of coal, and 22,000 passengers,—the transportation of the whole of which, the directors think, may safely be depended upon as being diverted to the railway."

Liverpool and Manchester Railway.—According to the report read at the half-yearly meeting of this Company, recently held at Liverpool, it appeared that the increase of the number of passengers, in the half-year ending 30th June, was 29,255, and of merchandise 7727 tons, conveyed to and from Manchester. The amount of receipts for passengers was 50,770*l.* 6*s.* 11*d.*; for merchandise, 44,014*l.* 5*s.* 4*d.*; total receipts, 94,784*l.* 12*s.* 3*d.*; total amount of expenses, 60,092*l.* 15*s.* 11*d.*; net profit, 36,691*l.* 16*s.* 4*d.*; added to this was 1332*l.* 2*s.* 2*d.*, the surplus profit of the half-year ending 30th June, 1833, making 36,023*l.* 18*s.* 6*d.*, from which sum the committee were enabled to recommend a dividend of 4*l.* 10*s.* per share.

The Bengal Steam Fund Committee have advertised, in the Indian papers, that the steamer "Forbes" would start from Kedgeree, for Suez, on the 15th April; so that by this time the letters and passengers ought to have arrived in England. As great dissatisfaction has been excited in the other Presidencies at the preference given to Bengal, something may have occurred to prevent the vessel's setting out at the appointed time. She was to carry only nine passengers—three from Bengal, and two each from Bombay, Madras, and Ceylon.—[London Mechanics' Magazine.]

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